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A successful approach by a small university to transportation management: A case study of Northeastern University, Thailand

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Abstract. Sustainability is a necessary consideration for ensuring quality of life for current and future generations. It is an absolute priority of Northeastern University (NEU), Khon Kaen, that both operational and academic efforts remain focussed towards delivering a positive impact on the natural world in both the immediate environment and beyond. The university has been a proud participant in the UI Green initiative since 2016 and has seen its green credentials rise significantly thanks to the collaborative efforts of staff – from the board of directors to academic, professional and operational staff – and both current and past students. The purpose of this paper is to highlight the practices of Northeastern University in relation to transportation management; a field in which the university has received the highest rating across six applicable green measurement metrics. By using time series analysis, we expect that this initiative will allow the university to achieve even higher scores by 2022. As a private university with a select student and staff base, the university aims to make efficiency savings wherever possible; however, these aims are aligned with the university's green initiatives, rather than working in conflict with them. The university has an absolute commitment to reducing CO₂ emissions, increasing renewable energy usage, and lessening carbon footprints on both an individual and institutional level.

Keyword:

NEU, sustainability, CO₂ emission, renewable energy

1. Introduction

Northeastern University was established in 1988, as the first private university in the northeastern region of Thailand. It is a small private university with over 2,000 students.

Sustainability is one long-term strategic goal of the university, and we see our role in sustainable development as planting a seed for future generations concerned with and responsible for social and environmental issues. Therefore, it is an absolute priority of our operational and academic efforts to have a positive impact on the natural world, in both the immediate environment and beyond [1].

Northeastern University joined UI Green Metric in 2016, and our performance in terms of sustainable development has improved constantly since then, as shown in Figure 1. Compared to other private universities in the region, we are ranked 1st. More information is available at the NEU Green University website [2].



Figure 1. World ranking of Northeastern University [2]

The category in which the university has the most outstanding performance is transportation (TR), as shown in Table 1, with 81.94% of the maximum points being awarded, meaning we are ranked 73rd in the world in this category.

Table 1. Scores for Northeastern University 2020 [2]

Category	Score	Proportion of total	Maximum score	Percentage of maximum
Setting and Infrastructure (SI)	1,025	15%	1,500	68.33%
Energy and Climate Change (EC)	1,325	19%	2,100	63.10%
Waste (WS)	1,050	15%	1,800	58.33%
Water (WR)	700	10%	1,000	70.00%
Transportation (TR)	1,475	21%	1,800	81.94%
Education (ED)	1,375	20%	1,800	76.39%
Total	6,950	100%	10,000	69.50%

Table 2 below shows the assessment score for transportation management of Northeastern University in the UI GreenMetric ranking, in which it has participated since 2016. From the lowest score of 606 points in 2016 we rose to the highest score of 1,475 points in 2020. Comparison of the 2019 and 2020 scores shows an increase of 250 points, equal to 20%.

Table 2. Assessment score for transportation initiatives of Northeastern University, 2016–2020

Category	Year					Percentage rise from 2019 to 2020
	2016	2017	2018	2019	2020	
Transportation	606	961	1,225	1,225	1,475	20%

It is our ambition to increase the score in 2021. Using time series analysis, we predict that by 2022, we may achieve a full score in this category. Table 3 presents the model fit statistics for the data, and indicates that the prediction equations yield: $R^2 = 0.889$; RMSE = 127.094; MAPE = 8.366; MaxAPE = 12.518; MAE = 86.407; MaxAE = 147.998; and Normalised BIC = 10.334.

Table 3. Model fit statistics

Fit statistic	
Stationary R-squared	0.769
R-squared	0.889
RMSE	127.094
MAPE	8.366
MaxAPE	12.518
MAE	86.407
MaxAE	147.998

Table 4 shows the forecast scores for transportation initiatives of Northeastern University for 2012 and 2022, predicting 1,688 and 1,888 points, respectively.

Table 4. Forecast assessment scores for transportation initiatives of Northeastern University, 2021-2022

Model	2021	2022
Forecast	1,688	1,888
UCL	2,092	2,310

Table 5 shows a comparison of between the UI Green Metric assessment scores and the forecast scores, and indicates that the average score assessed by UI Green Metric is 1,098, while the average forecast score is 1,281. The average forecast score is higher than the average UI Green Metric score by 183 points.

Table 5. Comparison between UI Green Metric scores and forecast scores for transportation initiatives, 2016-2022

	Year							Average score
	2016	2017	2018	2019	2020	2021	2022	
Score assessed by UI Green Metrics	606	961	1,225	1,225	1,475	-	-	1,098
Forecast score	655	841	1,077	1,322	1,493	1,688	1,888	1,281

Figure 2 presents a graph of the transportation initiative scores for Northeastern University, showing the observed data (2016-2020) and the predicted scores (2021-2022). Figure 3 shows the forecast data graph for the scores for the transportation initiatives of Northeastern University for 2016-2022, which increase every year.

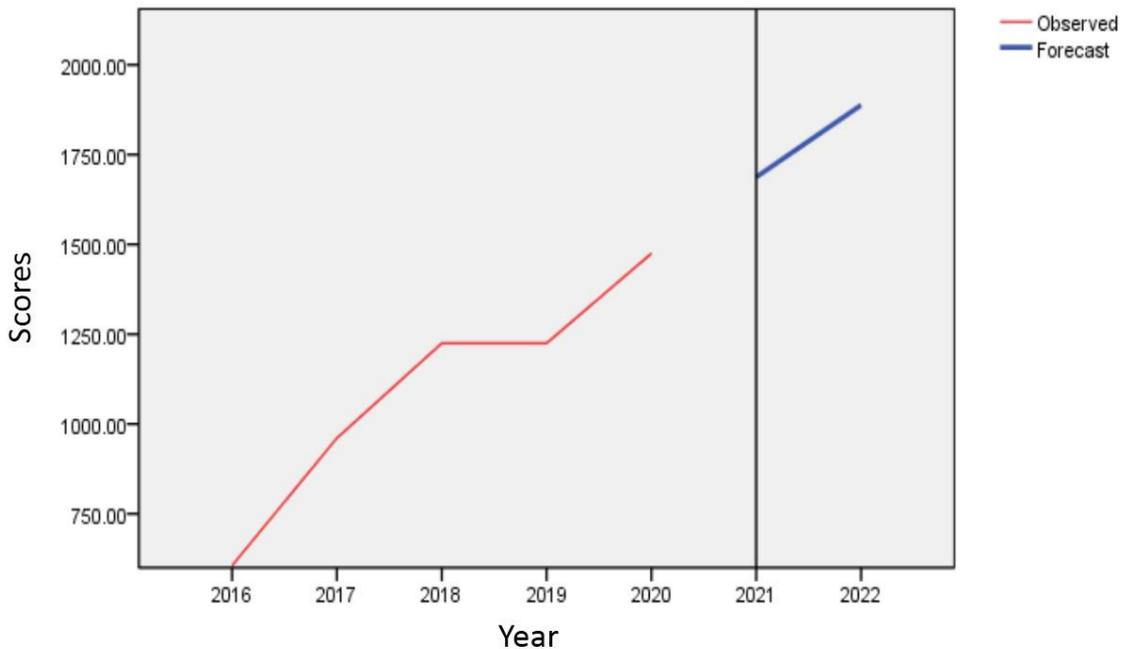


Figure 2. Assessed (2016-2020) and forecast (2021-2022) scores for transportation initiatives of Northeastern University

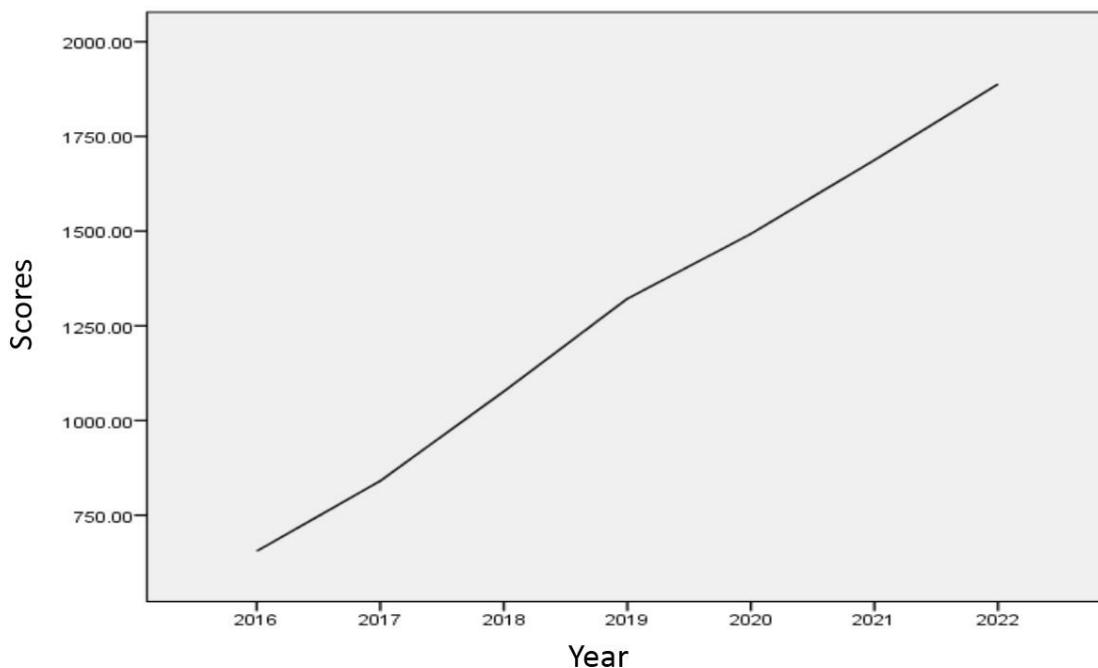


Figure 3. Forecast scores for transportation initiatives of Northeastern University, 2016-2022

Northeastern University received its highest assessed score of 1,475 points in 2020. The investment made to support transportation initiatives was 32,190 baht or 38% of the total budget. Based on the data collected in 2019, 1 point equals 21.82 baht spent. Therefore, to increase the score by 213 points (from 1,475 to 1,688 points) requires an estimated spend of 36,837.65 baht.

2. Concluding Remarks

This study of the trend in the assessment scores for the transportation initiatives of Northeastern University reveals that the score is likely to increase yearly until 2022. From the time series analysis of the assessment scores (2016 to 2020), the scores for the transportation initiatives of Northeastern University in the years 2021 and 2022 will be 1,688 and 1,888 points, respectively. The maximum score in the transportation category is 1,800 points. Therefore, Northeastern University is expected to develop measures related to transportation initiatives that will achieve the full score in 2022. The university had, prior the pandemic, intended to establish several measures on campus to reduce CO₂ emissions, increase renewable energy use, and lessen the carbon footprint in 2021 and 2022:

- 1) **NEU carpooling program to reduce private vehicles:** Carpooling is sharing car journeys so that more than one person travels in a car. An employer carpool encourages employees to share rides to and from work by allowing access to company vehicles. The arrangements for carpooling are made by using a group chat in the Line application. Employees of the university or students who are interested in carpooling can join the group.
- 2) **Bike sharing:** A bicycle-sharing system, public bicycle scheme, or public bike share (PBS) scheme, is a service in which bicycles are made available for shared use to

individuals on a short-term basis for free [3].

The plan that can still be applied during and potentially after the pandemic also includes:

- 3) **Employee holidays/days off:** Employees are allowed to select their days off and holidays. Unlike government universities, we can be more flexible. Employees can book up to two days off per week, between Saturday and Tuesday [4].
- 4) **Parking with odd-even vehicle number plates:** Vehicles with number plates ending with even numbers (0, 2, 4, 6 and 8) would be allowed to run on even dates, while those with odd numbers (1, 3, 5, 7 and 9) would be allowed to run on odd dates [5].
- 5) **Working from home:** During the pandemic, most employees have been working from home. An assessment of home working by the university reveals that the productivity and work efficiency of most employees has remained the same, and in some cases even improved. Therefore, the university intends to let employees select one day per week to work from home (when they are not required to be present at the university).

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